POSSIBILITIES OF PRODUCTION OF NEW HEAVIEST NUCLEI

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The experimental evaporation residue cross sections in cold (^{208}Pb- and ^{209}Bi-based) and hot (actinide-based) fusion reactions leading to the production of heavy and superheavy nuclei are well reproduced in the dinuclear system model of fusion [1-3]. In the cold fusion-evaporation reactions the dependence of the yield of heaviest nuclei on the isotopic composition of the projectile nucleus is studied. Projectiles with a larger number of neutrons are not expected to increase always the production cross section of superheavy nuclei. For the first time, the optimal excitation energies and the combinations of the colliding nuclei, such as ^{67,68}Zn, ^{73,74}Ge+^{208}Pb, are suggested for future experiments. The systematical experimental study of these reactions is needed to reveal the role of the subshell at N=162 for Z >110. Our results favour the use of ^{67,68}Zn and ^{73,74}Ge beams on ^{209}Bi target in the production of the 113 and 115 elements, respectively.

As main important outcome we found that in ^{48}Ca-induced hot fusion-evaporation reactions the actinide targets with smaller neutron excess are even more favorable within certain intervals than those with larger neutron excess. Therefore, our results could motivate the experimentalists to produce superheavies with more efficient target-projectile combinations.

For the first time, we show that the actinide-based reactions with stable projectiles heavier than ^{50}Ti projectile are not much promising for further synthesis of superheavies. New isotopes of superheavy nuclei with Z=110, 112, 114 and 115 could be produced in the reactions ^{40,42}Ar,^{50}Ti+^{238}U, ^{50}Ti+^{228,229,231}Th,^{235}U and ^{46}Ar,^{47}K+^{248}Cm.

A new method is suggested for calculating the charge and mass distributions of quasifission products [4]. The quasifission is treated within a transport model describing the evolution of a dinuclear system in charge (mass) asymmetry and the decay of this system along the internuclear distance.

The production of unknown isotopes of heaviest nuclei in the incomplete fusion reactions is treated.

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[4] Adamian G.G., Antonenko N.V., Scheid W., Phys. Rev. C **68** 034601 (2003).